Model 2021L
Loop Antenna
Unit Serial No. 885/IV

Operation And Maintenance Manual
P/N 12794873, Revision B

AUSTRON INC.
AUSTIN, TEXAS

AUSTRON INC. P.O. BOX 14766 - EXIT 248, N. IH 35, AUSTIN, TEXAS 78761-4766 (512) 251-2341 TWX 910/874-1356

Model 2021L
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Unit Serial No. 885/IV

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February 1988

FEB 18 1988

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INTRODUCTION

This manual provides specific instructions for operating and maintaining the AUSTRON Model 2021L Loop Antenna.

AMENDMENT NOTICE

AUSTRON, Inc. makes every attempt to provide up-to-date manuals with the associated equipment. Occasionally, changes are made to the equipment wherein it is necessary to provide amendments to the manual. If any amendments are provided for this manual they are printed on paper stock other than white and will be found at the rear of this manual.

NOTE

The content of any amendments may effect operation, maintenance or calibration of the equipment.

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N O T E S :

1. GENERAL DESCRIPTION

1.1. SCOPE OF SECTION

Section One introduces the AUSTRON Model 2021L Loop Antenna. This sections includes the purpose of the Model 2021L, the significant features, the model variations, and the electrical, mechanical, and environmental specifications.

1.2. PURPOSE OF EQUIPMENT

The AUSTRON Model 2021L Loop Antenna is intended for VLF and LF applications in which an optimum combination of ruggedness, versatility, performance, and economy is required.

The AUSTRON Model 2021L is a shielded-loop antenna tuned to 100 kHz intended for use in receiving VLF signals. The most common application is in receiving loran C signals.

Normal mounting of the antenna is to a horizontal surface by means of a standard four-inch pipe flange, supplied with the loop.

1.3. FEATURES

* Flat response for minimum distortion and envelope delay.
* Shielded, balanced loop construction for rejection of precipitation static and electrostatic interference fields.
* Simplicity of design for maximum economy and performance.

1.4. MODEL VARIATIONS

Three Model 2021L variations are available. These variations provide different cable connectors. Part numbers of these variations are:

P/N	Description
32092613	External BNC Connector
32092613-1	External TNC Connector
32092613-2	Internal BNC Connector

1.5. SPECIFICATIONS

The Model 2021L specifications are listed in the following table.

Table 1-1: Model 2021L Specifications

Electrical	
Frequency:	100 kHz
Area:	1.9 m2
Effective Height:	7.9 mm
Equivalent Height:	7.1 m (50 Ω termination)
Horizontal Pattern:	p = cos (Figure of Eight)
Impedance:	50 Ω, resistive
Physical	
Connector:	External BNC or TNC, or internal BNC
Mounting:	To horizontal surface by standard 3.5 inch-diameter pipe flange
Dimensions:	33.88 in (86.4 cm) x 34.25 in (87 cm) x 0.88 in (2.2 cm)
Weight:	6.5 lbs (2.9 kg)
Cabling:	100 ft (30.5 m) of RG-58 cable with appropriate connectors is shipped with each antenna.

2. INSTALLATION

2.1. SCOPE OF SECTION

Section Two describes the steps required to prepare the Model 2021L Loop Antenna for operation, or reshipment to another location. This section includes steps for unpacking, inspection, initial test and adjustments, and repacking instructions.

2.2. UNPACKING AND INSPECTION

Carefully remove the instrument from the shipping container. Verify the serial number on the antenna matches the number on the packing list. If it does not match, contact AUSTRON, Inc. immediately. Check the container carefully for any parts or accessories included with the Model 2021L.

2.3. INSTALLATION INSTRUCTIONS

2.3.1. Setup

Install the Model 2021L so the plane of the loop is vertical, and the "station" arrow on the manufacturer`s label points toward the loran C transmitter to be monitored. Mount the loop out-of-doors, as far as possible from electrically-powered machinery or other possible sources of electrical interference. Improved performance is obtained when the Model 2021L is mounted as high above the ground as is readily practicable.

NOTE

To minimize interference, do not connect the frame of the Model 2021L to an earth-grounded structure.

2.3.2. Connecting To The Receiver

Connect the Model 2021L to a 50 Ω loran C receiver antenna input with the supplied cable or by any length of 50 Ω cable, such as RG-58/A.

CAUTION

Do not allow the cable to contact earth or the system ground at any point except at the receiver. Also, do not install the cable through any cable trough or conduit holding high-level communications or power lines.

INSTALLATION INSTRUCTIONS (continued)

2.3.3. Signal Phasing

The Model 2021L is phased so that a positive voltage appears at the output when the incident field has a positive sign, and is coming from the direction to which the "station" arrow (on the manufacturer's label) points.

2.4. PREPARATION FOR RESHIPMENT

The following procedure describes preparation for reshipment of the antenna.

1. Disconnect cabling and remove antenna from mounting surface.

2. If possible, use original container designed for the instrument. Otherwise, use a strong carton (350 lb per sq in bursting strength) or wooden box to house the instrument.

3. For shipping, enclose the instrument in a suitable water- and -vapor proof plastic bag. Pad all projections, sharp edges, and other features which might tear or puncture the plastic.

4. Seal package with strong tape or metal bands. Mark package "DELICATE INSTRUMENT".

5. Refer to the warranty at the front of this manual and check with your AUSTRON representative for shipping instructions.

Refer to the instrument by its model number and serial number.

3. OPERATING INSTRUCTIONS

3.1. SCOPE OF SECTION

Section Three describes the operation of the Model 2021L Loop Antenna. This section includes a description of the normal operation of the antenna.

3.2. OPERATION

The "Figure of Eight" pattern is useful in receiving loran C signals when there is an interfering signal arriving from the "side" of the antenna. The antenna may be oriented to provide the maximum desired signal while minimizing an interfering signal.

N O T E S :

4. FUNCTIONAL DESCRIPTION

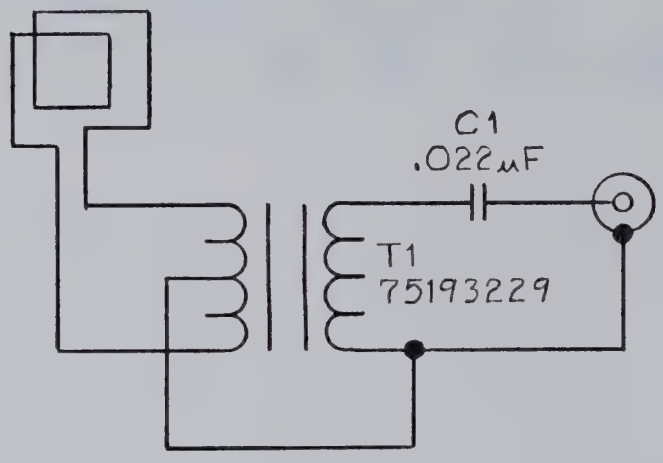
4.1. SCOPE OF SECTION

Section Four includes the theory of operation of the Model 2021L Loop Antenna.

4.2. THEORY OF OPERATION

Refer to the Model 2021L schematic, Dwg. No. 12393643. Electrically the Model 2021L antenna consists of a two-turn, electrostatically-shielded loop and a coupling network that transforms the loop impedance for terminating by approximately fifty ohms. Signals from the loop may be transmitted over any length of ordinary 50 Ω coaxial cable to an associated VLF or LF receiver. The shield is fabricated of rigid aluminum electrical conduit. To minimize residual electrostatic field-interference response, the necessary small gap in the shield is located at the top center of the loop.

REVISIONS			
LTR	DESCRIPTION	DATE	APPD
-	RELEASED	4-7-83	



		TOLERANCES UNLESS OTHERWISE SPECIFIED			AUSTRON INC. AUSTIN, TEXAS
		DEC	FRAC	ANG	
		MATERIAL:			SCHEMATIC, LOOP ANTENNA
	2021L-01				
NEXT ASSY	USED ON	ENGR			SIZE 1 / CODE IDENT NO. 24672 / 12393643 / REV
APPI 4-2 DN		CHECK		4-4-83	
		DRAWN		4-4-83	SCALE NONE / SHEET 1 OF 1

5. MAINTENANCE

5.1. SCOPE OF SECTION

Section Five details all preventive and corrective maintenance requirements of the Model 2021L antenna.

5.2. PREVENTIVE MAINTENANCE

The Model 2021L and the associated connectors and cables require annual checks for weatherproofing, corrosion, or environment-related problems and inspection for cracks, cuts, or abrasions.

5.3. CORRECTIVE MAINTENANCE

Use of standard continuity checks and visual inspection is sufficient to troubleshoot the Model 2021L antenna.

N O T E S :

6. PARTS LIST

6.1. SCOPE OF SECTION

Section Six provides an illustration, Antenna - Model 2021L, of the antenna assembly with part numbers called out.

6.2. ORDERING REPLACEMENT PARTS

To order replacement parts from AUSTRON, Inc., address the order to:

AUSTRON, Inc.
P. O. Box 14766
Austin, Texas 78761
TWX 910/874-1356
FAX 512-251-9685

Specify for each part, the AUSTRON part number, revision letter (if applicable), and part description.

N O T E S :

Dwg. No. 27093644-* Rev L Size 3 reduced to 2
Figure 6-1: Final Assembly, Antenna Model 2021L-01.

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AUSTRON, Inc.
P. O. Box 14766
Austin, Texas 78761

1

D

C

B

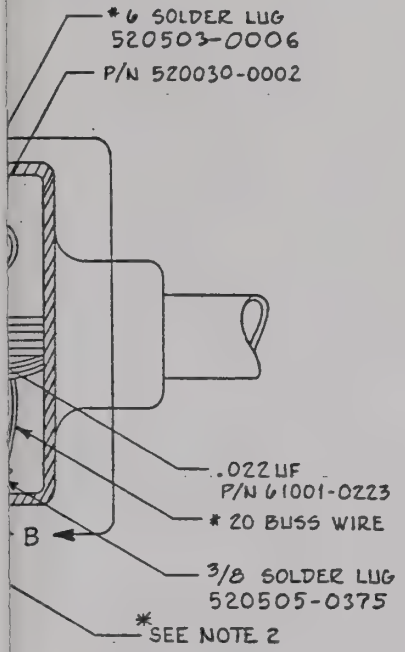
A

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	REVISED PER ECO 488	1-10-73	
B	REVISED PER ECO 995	9-24-75	
C	CHANGED POTTING MATERIAL IN NOTE 5 PER ECO #1683	10-25-76	
D	ADDED NOTE #5; CHANGED NOTE 5 TO NOTE 6; PER ECO 2256	4-14-78	
E	REVISED PARTS LIST PER ECO. #2770	4-12-79	
F	LABEL WAS ON COVER PLATE, ADDED DETAIL B, REWROTE NOTES 1 THRU 5 PER ECO 3274	5-29-80	
G	ADDED XFMR START/FINISH INFO PER ECO 3558	4-9-81	
H	ARROW WAS POINTING LEFT (VIEW C-C) ECO 3958	11-23-81	
J	REPLACED COVER PER ECO 4253; WAS 520415-0001	2-21-82	
K	REVISED PER ECO 10717	3-11-87	

75193229

EEN START



DES	PART NO	NOMENCLATURE	VENDOR

LIST OF MATERIAL

5. A P
4. S
3. S
2. F F
F
1. F F

8-6-71

AUSTRON INC. AUSTIN, TEXAS

FINAL ASS'Y., ANTENNA
MODEL 2021L-01

SIZE	CODE IDENT NO.		
3	6-3	270 93644-*	L

SCALE — 5 SHEET 1 OF 1

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Austin, Texas 78761

C/3	L	CHANGED LID P/N ECO 10795	4-14-87	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	REVISED PER ECO 488	1-10-73	
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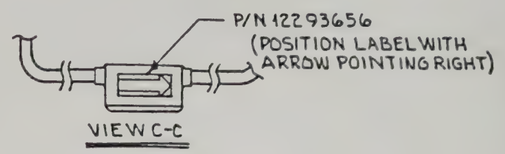
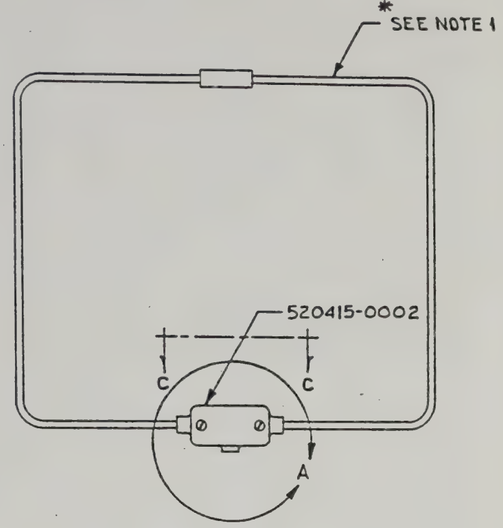
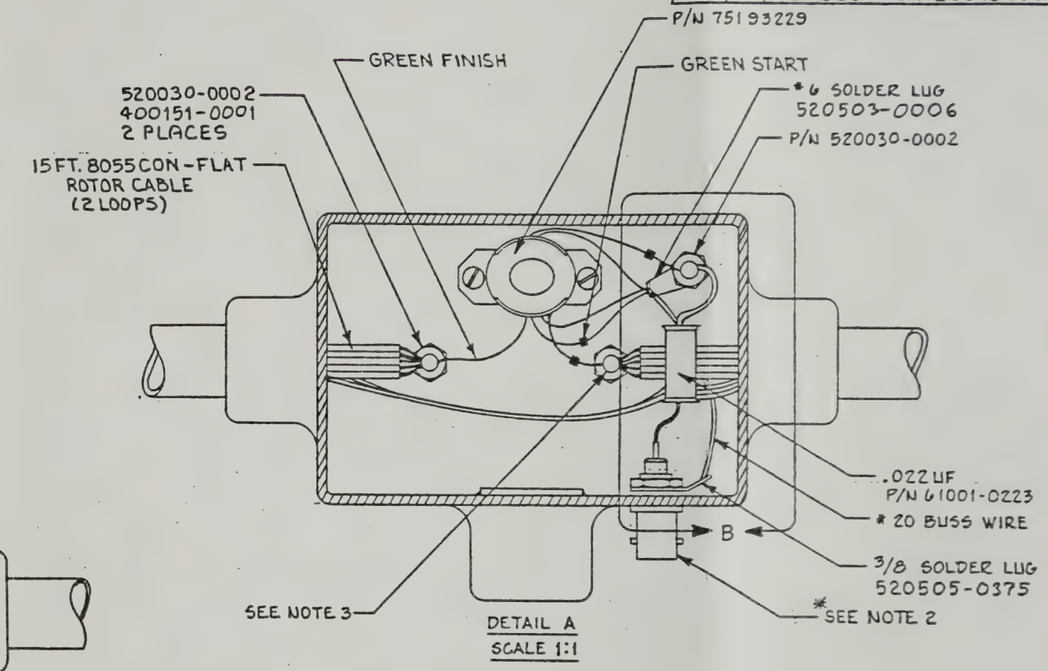
	G	ADDED XFMR START/FINISH INFO PER ECO 3558	4-9-81	
	H	ARROW WAS POINTING LEFT (VIEW C-C) ECO 3958	11-23-81	
	J	REPLACED COVER PER ECO 4253; WAS 520415-0001	2-21-82	
	K	REVISED PER ECO 10717	3-11-87	

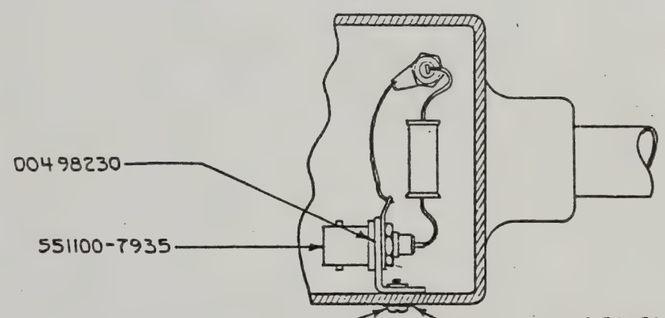


VIEW C-C





DETAIL A
SCALE 1:1



DETAIL "B"
SCALE 1:1
(ALL COMPONENTS & WIRING NOT SHOWN OR CALLED OUT ARE SAME AS DETAIL A)

5. AFTER ASSEMBLY, SECURE WIRES TO BACK OF BOX WITH 3145 RTU COMPOUND; AFTER CURE, SPRAY WITH TWO COATS OF HUMISEAL TYPE 1B15H
4. SCHEMATIC REFERENCE : 123 93643
3. SOLDER ALL CONNECTIONS.
2. FOR ASSY NO. 270 93644 INSTALL CONNECTOR NO. 551100-0625
FOR ASSY NO. 270 93644-1 INSTALL CONNECTOR NO. 551100-8001
FOR ASSY NO. 270 93644-2 SEE DETAIL "B".
1. FOR ASSY NOS. 270 93644 AND 270 93644-1 USE P/N 120 94937;
FOR ASSY NO. 270 93644-2 USE P/N 120 94937-1
NOTES:

QTY REQD	ITEM NO	REF DES	PART NO	NOMENCLATURE	VENDOR
-1				LIST OF MATERIAL	

320 92613	2021 L01
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DO NOT SCALE DRAWINGS

TOLERANCES
UNLESS OTHERWISE SPECIFIED

DECIMALS	FRACTIONS	ANGLES

MATERIAL:

ENGINEER		
CHECKED		
DRAFTSMAN	S. Kojac	8-6-71

AUSTRON INC. AUSTIN, TEXAS

FINAL ASS'Y., ANTENNA
MODEL 2021L-01

SIZE	CODE IDENT NO.		
3	6-3	270 93644-*	L
SCALE —		5 SHEET 1 OF 1	

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Model 2026W

LORAN-C VERTICAL ANTENNA

Model 2021L

LORAN-C DIRECTIONAL ANTENNA

MODEL 2021L LOOP ANTENNA
AND
MODEL 2026W AND WHIP ANTENNA
INSTALLATION INSTRUCTIONS

Introduction

The antenna installation instructions provide information to help you determine the best antenna type, the best location and special precautions to take when mounting and connecting the antenna you are using.

Antenna Selection

AUSTRON recommends two antennas for use with the AUSTRON receiver. They are the AUSTRON Model 2021L Loop Antenna and the AUSTRON Model 2026 Whip Antenna. The preferred antenna is the Model 2026 Whip, because it is nondirectional, allowing reception of all signals at the receiver location, and it has less signal loss than the Model 2021L Loop. Other antennas can be used with the receivers, but are not recommended. Cycle selection problems may be introduced, because of the response of these other antennas, with AUSTRON receivers.

NOTE

> For time synchronization, it is important to know which station is being tracked. If a master station is selected, no identification problem exists, and either antenna may be used. If, however, a secondary station is desired, the Model 2100 must be able to simultaneously receive the master and the secondaries. If a loop antenna is used, it may cancel the master signal, because of its directionality, making it impossible to acquire the desired secondary.

If a whip antenna is used, it is easy to change stations being tracked. The operator enters the information for the new station and restarts acquisition. If a loop is used, it may also be necessary to rotate the loop toward the new station to maximize the signal strength.

Despite its limitations, the loop antenna may be the best antenna for some locations. Conditions which would favor use of a loop antenna are:

1. A strong, nearby transmitter, operating in or near the bandwidth of LORAN-C (roughly 90-110 kHz). In this case, the loop would be positioned to null the interferring signal while preserving the LORAN-C signal.

2. Suitable receiver and LORAN-C station geometry. That is, all stations required are in roughly the same place as the loop, so that the loop does not completely null the master when it is pointed toward the secondary of interest.

Antenna Location

When installing either antenna, locate it away from other antennas and large metal objects. If possible, mount it high enough to clear objects in the near vicinity and connect the base to a good, earth ground. Rotate the loop so the arrow on the antenna base points towards the station to be tracked. After entering the TRACKING mode, rotate the loop to obtain the maximum signal or to obtain the best compromise between signal strength and noise.

Notch Filters

Of the noise sources mentioned, carrier wave interference is probably the most significant. The 40 kHz bandwidth filter in the receiver will effectively reduce frequencies below 80 kHz and above 120 kHz. However, frequencies outside this range may still cause acquisition problems if the signal is strong enough. Frequencies outside the bandwidth of LORAN-C (90-110 kHz) can be effectively reduced by using a loop antenna or by installing notch filters. For frequencies within this range, it is probably best to use just a loop antenna. Use of notch filters within the LORAN-C frequency range should be avoided because they will cause distortion of the LORAN-C envelope, affecting acquisition.

NOTE

Notch filters will introduce additional delay which must be accounted for if time synchronization to better than 10 usec is desired.

Noise

Because of noise, the tracking point of the LORAN-C signal, and therefore, the synchronized 1 pps, may vary by ±50 nsec. To reduce the jitter, a longer time constant can be selected which will reduce the receiver response to short term changes.

Mounting Precautions

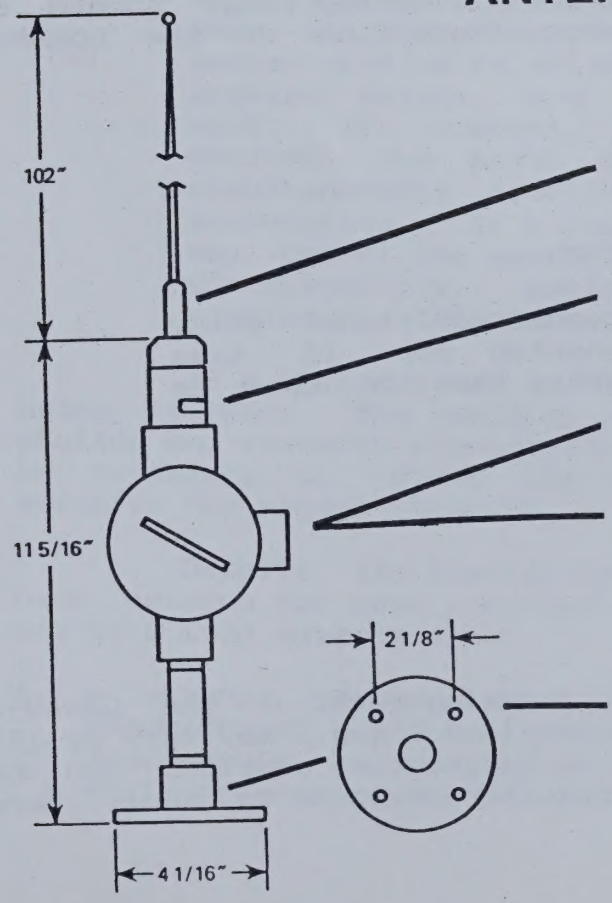
CAUTION

Use care when securing the stainless steel whip antenna (102 inch) Model 2026W to prevent stripping the internally threaded top piece of the coupler. Ensure the coupler does not turn as the whip antenna is being installed and tightened. A suitable backup wrench is recommended during this installation step.

Weatherproofing

After the RG-58 C/U cable is connected to the coupler, an application of a weatherproof adhesive/sealant such as Dow Corning 3145 RTV is recommended. On the Model 2026W Antenna, it can be applied directly into the cavity surrounding the BNC or a packing can be inserted prior to the application of the RTV. On the Model 2021L Antenna, a coating of RTV can be applied directly to the BNC mounted on the housing. This will ensure a weatherproof connection to the antennas.

LORAN-C VERTICAL ANTENNA



* Stainless Steel Whip screws into the Antenna Coupler.

* NOTE: Use back-up wrench here to hold coupler while securing antenna.

* Antenna Connector is recessed inside of the Antenna Coupler.

* NOTE: After making connection, insert packing material around the BNC connectors and seal off recess with RTV.

* Mounting Plate:
  1. Outside Diameter = 4 in
  2. Mounting holes are at 90° offset.
  3. Used also on 2021L Loop Antenna.